

## REMARKS

Entry of the foregoing amendments is respectfully requested.

### Summary of Amendments

Upon entry of the foregoing amendments, claim 74 is cancelled and claim 77 is added, whereby claims 44-73 and 75-77 will be pending, with claims 44 and 56 being independent claims.

Support for new claim 77 can be found throughout the present specification (see, e.g., page 5 thereof).

Further, page 17 of the instant specification has been amended by correcting an incorrect (or at least ambiguous) translation of the originally filed German language text. In particular, the terms “bis 350°C”, “bis 560°C” and “bis 120°C” were translated as “bis zu ...°C” (“up to ... °C”) instead of “to ... °C”. At any rate, it is apparent that it would not make sense to indicate in an Example details such as the heating rate, the oxygen fraction in the oven and the pressure and to at the same time leave it completely open what the final temperature of the heating step was. For example, “up to 350°C” could mean any final temperature that does not exceed 350°C, such as, e.g., 100°C, 200°C, 300°C, etc. Also, if one were to assume that the temperature in the 2<sup>nd</sup> stage of Example 1 could have been any temperature that does not exceed 560°C it does not make sense to indicate that after a holding period of 60 min the oven was cooled to 350°C (implying that the previous temperature was higher than 350°C).

**Summary of Office Action**

Claims 44-76 are rejected under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the written description requirement.

Claims 44, 45, 49-51, 53-59, 63-66, 68-73, 75 and 76 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Mennig et al., U.S. Patent No. 6,162,498 (hereafter “MENNIG”) in view of Horne et al., US 2003/0118841 (hereafter “HORNE”).

Claims 46 and 60 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over MENNIG in view of HORNE and further in view of Wizon, U.S. Patent No. 3,565,749 (hereafter “WIZON”).

Claims 52 and 67 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over MENNIG in view of HORNE and further in view of Chou et al., “Sol-Gel-Derived Hybrid Coatings for Corrosion Protection” in J. Sol-Gel Sci. and Tech. 26, pp. 321-327, 2003 (hereafter “CHOU”).

Claim 74 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over MENNIG in view of HORNE and further in view of Callister, Materials Science and Engineering: An Introduction, 5<sup>th</sup> ed. (c) 2000, John Wiley & Sons, Inc., pp. 169-171 (hereafter “CALLISTER”).

Claims 44, 47-51, 53-58, 61-66, 68-73, 75 and 76 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over MENNIG in view of Loxley et al., U.S. Patent No. (hereafter “LOXLEY”).

Claims 52 and 67 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over MENNIG in view of LOXLEY and further in view of CHOU.

Claim 74 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over MENNIG in view of LOXLEY and further in view of CALLISTER.

**Response to Office Action**

Reconsideration and withdrawal of the rejections of record are respectfully requested, in view of the foregoing amendments and the following remarks.

***Response to Rejections under 35 U.S.C. § 112, First Paragraph***

Claims 44-76 are rejected under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the written description requirement. In particular, the Examiner continues to take the position that there is inadequate support for the recited first heat treatment “to an end temperature of at least 350°C” (for A) and “to an end temperature of at least 120°C” (for B) in claims 44 and 56, especially in view of the exemplified embodiments which allegedly appear to employ temperatures below the recited temperatures.

Applicants respectfully traverse this rejection for all of the reasons which are set forth in the response filed together with the Request for Continued Examination. The corresponding remarks are expressly incorporated herein.

It further is pointed out that the translation of Examples 1 and 2 of the original PCT application (filed in German) has been corrected, wherefore it is now clear that contrary to what is alleged in the instant Office Action, the temperatures for the first heating step indicated in these Examples are the final temperatures, not maximum temperatures that must not be exceeded.

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Accordingly, one of ordinary skill in the art will understand that for variant A the end temperature of the first stage heating should preferably be at least 350°C (but preferably not higher than about 400°C) and that for variant B the end temperature of the first stage heating should preferably be at least 120°C (but preferably not higher than about 500°C).

Applicants submit that for at least all of the foregoing reasons, the instant rejection under 35 U.S.C. § 112, first paragraph, is unwarranted and should be withdrawn, which action is respectfully requested.

***Response to Rejections under 35 U.S.C. § 103(a) over MENNIG in View of HORNE***

Claims 44, 45, 49-51, 53-59, 63-66, 68-73, 75 and 76 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over MENNIG in view of HORNE. The Examiner essentially takes the position that MENNIG teaches a process of the type recited in the rejected claims but concedes that MENNIG fails to disclose the two-stage thermal densification recited in the instant independent claims. In this regard, the rejection alleges that HORNE cures the noted deficiency of MENNIG with respect to alternative (A) of the first stage of the two-stage thermal densification recited in instant claims 44 and 56.

Applicants respectfully traverse this rejection. In particular, there is no motivation for one of ordinary skill in the art to combine the teachings of MENNIG and HORNE. For example, MENNIG discloses a process for providing a metallic surface with a vitreous layer which is both decorative and scratch resistant and corrosion inhibiting. Said process involves the application of a coating composition which is obtainable by a process comprising the hydrolysis and polycondensation of

one or more silanes or oligomers derived therefrom in the presence of nanoscaled SiO<sub>2</sub> particles and/or at least one compound selected from the oxides and hydroxides of the alkali and alkaline earth metals onto the metallic surface and the thermal densification of the resulting coating to form a vitreous layer. See, e.g., abstract of MENNIG.

Further, according to col. 5, lines 48-59 of MENNIG the process taught therein is particularly suited for the coating of articles of everyday use which have a metallic surface or consist of metal, such as panels, cuttlery, bowls, sinks, door and window handles and the like. The invention disclosed by MENNIG provides a decorative system which can advantageously be applied onto metallic surfaces, is weathering resistant and insensitive to scratching and also assists in the prevention of staining, e.g., by fingerprints, etc. Further, Example 4 of MENNIG describes the coating of stainless steel, brass and aluminum with a SiO<sub>2</sub> coating sol, a sodium silicate coating sol and a potassium silicate coating sol prepared according to Examples 1 to 3 thereof by hydrolysis and polycondensation of suitable starting materials. The applied coating sol was first dried at room temperature and thereafter at 80°C for one hour, followed by densification through heating in air or nitrogen at a temperature of 400°C or 500°C for 1 hour. The resultant coating was corrosion resistant in a salt spray test. Examples 5 and 6 of MENNIG describe similar coating compositions and procedures.

In contrast to MENNIG, HORNE does not describe the coating of metallic substrates but relates to optical materials and optical devices (see, e.g., title). According to the abstract of HORNE, nanoscale particles, particle coatings/particle arrays and corresponding consolidated materials are described based on an ability to vary the composition involving a wide range of metal and/or

metalloid elements and corresponding compositions. In particular, metalloid oxides and metal-metalloid compositions are described in the form of improved nanoscale particles and coatings formed from the nanoscale particles. Compositions comprising rare earth metals and dopants/additives with rare earth metals are described. Complex compositions with a range of host compositions and dopants/additives can be formed using the approaches described therein. The particle coating can take the form of particle arrays that range from collections of dispersable primary particles to fused networks of primary particles forming channels that reflect the nanoscale of the primary particles. Suitable materials for optical applications are described along with some optical devices of interest.

HORNE further explains in paragraph [0003] thereof that “[a]n explosion of communication and information technologies including internet based systems has motivated a world wide effort to implement optical communication networks to take advantage of a large bandwidth available with optical communication. The capacity of optical fiber technology can be expanded further with implementation of Dense Wavelength Division Multiplexing technology. With increasing demands, more channels are needed to fulfill the system functions. Integrated planar components can be used to replace discrete optical components to supply the desired capacity. To form these integrated structures, there is considerable interest in the formation of specific compositions applied to substrates. In order to form optical devices with high quality optical coatings from these materials, the coating properties need to be specified accordingly.” Emphasis added.

Paragraphs [0294] to [0302] of HORNE specifically relied upon by the Examiner describe the coating of a silicon substrate (i.e., a silicon wafer) with a silica glass including alumina and

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sodium oxide glass formers and an erbium dopant using light reactive deposition in which wafer coating was performed within a reaction chamber by sweeping the substrate through a product particle stream, heat treatment in an oxygen atmosphere and consolidation in an inert atmosphere. In particular, the coating was performed with a static coating configuration. An oxygen/ethylene flame was started first. Then, the aerosol flow was started. When a stable process flame was observed, the wafer was translated into the coating position about 17 inches above the laser beam. The wafer was left in the flow for about 30 minutes. An aerosol of the solution was carried into the reaction chamber along with argon, ethylene and molecular oxygen gasses. Argon gas was mixed with the reactant stream as a diluent/inert gas to moderate the reaction.  $C_2H_4$  gas was used as a laser absorbing gas.  $O_2$  was used as an oxygen source. The coated wafers were heated in a muffle furnace. The wafers were first heated at  $450^\circ C$  in an oxygen atmosphere to remove carbon contaminants and then at a  $T_{max}$  in a helium atmosphere to complete consolidation of the glass.  $T_{max}$  was either  $1100^\circ C$  or  $1200^\circ C$ .

In view of the foregoing, it is apparent that neither the substrates to be coated nor the coating compositions to be densified, nor the desired properties of the finished coatings according to MENNIG and HORNE have anything in common, wherefore it is not seen that one of ordinary skill in the art wishing to modify (or even improve) the coating process of MENNIG would expect to find any useful information in this regard in HORNE.

Further, according to paragraph [0298] of HORNE the flame temperature to produce the particle stream was at least  $750^\circ C$ . At such high temperatures and in the presence of oxygen, organic groups of the precursors will be almost completely pyrolyzed so that the produced particles are

essentially inorganic. Generally organic groups are oxidized to gaseous CO<sub>2</sub>, although some carbon such as carbon black may remain in small amounts in the inorganic particles produced (see, e.g., the impurities such as C, H, N etc. of 1 wt % mentioned in paragraph [0290] of HORNE). Accordingly, one of ordinary skill in the art will understand that the first coating heating step of the process of HORNE is intended to remove certain impurities such as carbon (carbon contaminants as mentioned in paragraph [0300] of HORNE) on the surface of the particles to achieve high purity (see also paragraph [0241] of HORNE), whereas the second heating step is a sintering step to obtain amorphous, crystalline or polycrystalline phases (see also paragraph [0258] of HORNE). None of these objectives are of interest for the coating on metal surfaces according to MENNIG. For example, it is apparent that the coating sol of MENNIG does not contain carbon contaminants that need to be removed (and even if it did, this would not matter because in contrast to the coating of HORNE, the coating on metal surfaces of MENNIG is not required to be of high optical quality but only needs to be scratch resistant and corrosion inhibiting).

Applicants submit that for at least all of the foregoing reasons, the instant rejection under 35 U.S.C. § 103(a) over MENNIG in view of HORNE is without merit, wherefore withdrawal thereof is warranted.

***Response to Remaining Rejections under 35 U.S.C. § 103(a) over MENNIG/HORNE***

Claims 46 and 60 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over MENNIG in view of HORNE and further in view of WIZON. Claims 52 and 67 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over MENNIG in view of HORNE and further in



view of CHOU, and claim 74 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over MENNIG in view of HORNE and further in view of CALLISTER.

Applicants respectfully traverse these rejections as well. In particular, all of the rejected claims are dependent claims and are not rendered obvious for at least all of the reasons which are set forth above with respect to the independent claims from which they depend. WIZON, CHOU and CALLISTER clearly fail to cure the noted deficiencies of MENNIG and HORNE, wherefore Applicants refrain from specifically commenting on the allegations with respect to WIZON, CHOU and CALLISTER which are set forth in the present Office Action, without admitting, however, that any of these allegations is meritorious.

***Response to Rejections under 35 U.S.C. § 103(a) over MENNIG in View of LOXLEY***

Claims 44, 47-51, 53-58, 61-66, 68-73, 75 and 76 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over MENNIG in view of LOXLEY. The Examiner essentially takes the position that MENNIG teaches a process of the type recited in the rejected claims but concedes that MENNIG fails to disclose the two-stage thermal densification recited in the instant independent claims. In this regard, the rejection alleges that LOXLEY and in particular, the passage from col. 9, line 30 to col. 10, line 57 thereof, cures the noted deficiency of MENNIG with respect to alternative (B) of the first stage of the two-stage thermal densification recited in instant claims 44 and 56.

Applicants respectfully traverse this rejection as well. In particular, there is no motivation for one of ordinary skill in the art to combine the teachings of MENNIG and LOXLEY. For example,

MENNIG discloses a process for providing a metallic surface with a vitreous layer which is both decorative and scratch resistant and corrosion inhibiting. Said process involves the application of a coating composition which is obtainable by a process comprising the hydrolysis and polycondensation of one or more silanes or oligomers derived therefrom in the presence of nanoscaled SiO<sub>2</sub> particles and/or at least one compound selected from the oxides and hydroxides of the alkali and alkaline earth metals onto the metallic surface and the thermal densification of the resulting coating to form a vitreous layer. See, e.g., abstract of MENNIG.

Further, according to col. 5, lines 48-59 of MENNIG the process taught therein is particularly suited for the coating of articles of everyday use which have a metallic surface or consist of metal, such as panels, cutlery, bowls, sinks, door and window handles and the like. The invention disclosed by MENNIG provides a decorative system which can advantageously be applied onto metallic surfaces, is weathering resistant and insensitive to scratching and also assists in the prevention of staining, e.g., by fingerprints, etc. Further, Example 4 of MENNIG describes the coating of stainless steel, brass and aluminum with a SiO<sub>2</sub> coating sol, a sodium silicate coating sol and a potassium silicate coating sol prepared according to Examples 1 to 3 thereof by hydrolysis and polycondensation of suitable starting materials. The applied coating sol was first dried at room temperature and thereafter at 80°C for one hour, followed by densification through heating in air or nitrogen at a temperature of 400°C or 500°C for 1 hour. The resultant coating was corrosion resistant in a salt spray test. Examples 5 and 6 of MENNIG describe similar coating compositions and procedures.

In contrast to MENNIG, LOXLEY does not describe the coating of metallic substrates but relates to sintered quartz glass products and methods for making same (see, e.g., title). According to the abstract of LOXLEY, a number of unique processes are disclosed for manufacture of sintered high-purity quartz glass products in which a shaped silica body or preform is made from an aqueous slurry of micronized silica particles by gel casting, slip casting or electrophoretic deposition. In one embodiment of the invention the sintered quartz glass is transparent, substantially bubble-free and suitable for scientific or optical uses.

Further, the passage of LOXLEY relied upon by the Examiner, i.e., col. 9, line 30 to col. 10, line 57 states, *inter alia* (emphasis added):

Other embodiments of the present invention relate to the manufacture of transparent quartz glass products with a reduced bubble content and particularly helium-sintered products with a minimal bubble content or with sound optical properties.

[...]

Other modifications in the production process can be helpful in minimizing the bubble problem including changes in the slurry and in the sintering procedures. It can be advantageous to sinter the fired porous silica preform in two stages over a substantial period of time rather than in a single furnace in 6 to 12 minutes as in U.S. Pat. No. 4,072,489. Rapid sintering to a temperature of 1600° C. to 1750° C. according to said patent is non-uniform and intended to provide a temperature gradient. In a two-stage process wherein the preform is first sintered for 30 minutes to 3 hours or more at a temperature of from about 1400° C. to about 1500° C., the first-stage of the sintering causes more uniform heating of the silica and promotes the formation of cells with a more uniform pore size.

A two-stage process is particularly effective when the porous preform is mounted on a porous or perforated mandrel and flushed with helium at a temperature of at least 1400° C. for 20 to 30 minutes or more during the first stage sintering. It has been discovered that such pre-sintering in helium at least 1400° C. at a temperature of 1450° to 1600° C. followed by the standard helium sintering for 5 minutes or more to a temperature of 1750° C. can produce superior transparent quartz glass with a minimal bubble content.

The two-stage sintering process can be carried out in such manner as to cause a substantial increase in the density of the preform and/or to seal the pores thereof during the first stage. The first-stage sintering can be carried out for 1 to 3 hours in an atmosphere of helium or in a vacuum at a suitable low pressure (preferably below 5 torrs) to increase the density to at least 90 percent. If the density of the preform is increased to 95 volume percent or so to close and seal the pores, then the second-stage sintering in the induction furnace can be carried out in an atmosphere of argon or other inert gas.

For example, as described hereinafter (See EXAMPLE V), the first-stage sintering can be carried out in a vacuum by heating the porous silica preform to a temperature of from about 1400° C. to 1500° C. for a period of time sufficient to increase the density to about 95 percent and to close the pores of the quartz glass. The second-stage sintering of the preform can then be carried out in an inert atmosphere in accordance with EXAMPLES I and V wherein the glass temperature is increased from below 1400° C. to more than 1700° C.

A typical two-stage process for making transparent quartz glass comprises preparing a porous silica preform from a slurry (as in EXAMPLE I) consisting essentially of at least about 80 percent by weight of high-purity micronized silica particles and up to about 20 percent by weight of water, drying and firing the preform, presintering the fired preform for at least about one-half hour at a temperature of from about 1350° C. to about 1600° C. and thereafter sintering the glass to full density by heating it to a temperature above 1700° C.

The above passage of LOXLEY clearly relates to the production of an article of quartz glass with superior transparency due to a minimal bubble content. Even if one were to assume, *arguendo*, that one of ordinary skill in the art wanted to coat a metallic surface with quartz glass with superior transparency and if one were to further assume that the process for making an article made of quartz glass described by LOXLEY can be adapted for making a coating of quartz glass, it is apparent that the high temperatures involved (more than 1700° C in the second stage of the process) would not be suitable for metallic substrates, many of which would melt at these temperatures.

Applicants submit that in view of the foregoing, it is apparent that one of ordinary skill in the art wishing to modify (or even improve) the coating process of MENNIG would not expect to find any useful information in this regard in LOXLEY. Accordingly, there is no apparent reason for one

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of ordinary skill in the art to combine the teachings of MENNIG and LOXLEY, let alone in the way suggested by the Examiner.

It is submitted that for at least all of the foregoing reasons, the instant rejection under 35 U.S.C. § 103(a) over MENNIG in view of LOXLEY is without merit as well, wherefore withdrawal thereof is respectfully requested.

***Response to Remaining Rejections under 35 U.S.C. § 103(a) over MENNIG/ LOXLEY***

Claims 52 and 67 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over MENNIG in view of LOXLEY and further in view of CHOU. Claim 74 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over MENNIG in view of LOXLEY and further in view of CALLISTER.

Applicants respectfully traverse these rejections as well. In particular, all of the rejected claims are dependent claims and are not rendered obvious for at least all of the reasons which are set forth above with respect to the independent claims from which they depend. CHOU and CALLISTER clearly fail to cure the noted deficiencies of MENNIG and LOXLEY, wherefore Applicants refrain from specifically commenting on the allegations with respect to CHOU and CALLISTER which are set forth in the present Office Action, without admitting, however, that any of these allegations is meritorious.

**CONCLUSION**

In view of the foregoing, it is believed that all of the claims in this application are in condition for allowance, wherefore an early issuance of the Notices of Allowance and Allowability is again respectfully solicited. If any issues yet remain which can be resolved by a telephone conference, the Examiner is respectfully invited to contact the undersigned at the telephone number below.

Respectfully submitted,  
Klaus ENDRES et al.

/Heribert F. Muensterer/  
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